

Theory of Structure (315313)

MSBTE Diploma · K-Scheme · Model Question Paper — Set B

Time: 4 Hours**Max. Marks: 70****Instructions:**

1. All questions are compulsory.
2. Answer each next main question on a new page.
3. Illustrate your answers with neat sketches wherever necessary.
4. Figures to the right indicate full marks.
5. Assume suitable data, if necessary.
6. Use of non-programmable electronic pocket calculator is permissible.
7. Mobile phone, pager and any other electronic communication devices are not permissible in the examination hall.

Q.1 Attempt any FIVE of the following:**10**

- a) State the relationship between bending moment, slope and deflection of a beam.
- b) Define carry-over moment and carry-over factor.
- c) Define perfect frame and imperfect frame.
- d) Define fixed beam. Give one practical example.
- e) Define flexural rigidity and stiffness of a beam.
- f) Draw a neat sketch of a symmetrical portal frame having one bay and two storeys.
- g) State the boundary conditions at the fixed end of a cantilever.

Q.2 Attempt any THREE of the following:**12**

- a) A simply supported beam of span 6 m carries a central point load of 50 kN. Calculate the maximum slope and maximum deflection using standard formulae. Take $E = 2 \times 10^5 \text{ N/mm}^2$ and $I = 1.2 \times 10^8 \text{ mm}^4$.
- b) A cantilever 3 m long carries a UDL of 6 kN/m over its entire length and a point load of 10 kN at the free end. Find the slope and deflection at the free end. Take $E = 2 \times 10^5 \text{ N/mm}^2$ and $I = 6 \times 10^7 \text{ mm}^4$.
- c) A fixed beam of span 5 m carries a UDL of 24 kN/m over the entire span. Find the fixed end moments from first principles and draw the BMD.
- d) A continuous beam ABC is simply supported at A, B and C. Span AB = 5 m carries a point load of 50 kN at 2 m from A, and span BC = 4 m carries a UDL of 30 kN/m. Find the support moment at B using the theorem of three moments.

Q.3 Attempt any THREE of the following:**12**

- a) State Clapeyron's theorem of three moments and explain the meaning of each term with a sketch.

- b) A fixed beam AB of span 6 m carries a UDL of 10 kN/m over the whole span and a point load of 30 kN at 2 m from A. Calculate the fixed end moments and draw the BMD.
- c) Calculate the distribution factors for members OA, OB and OC meeting at rigid joint O shown in Fig. No. 1. Ends A and C are fixed and end B is hinged.

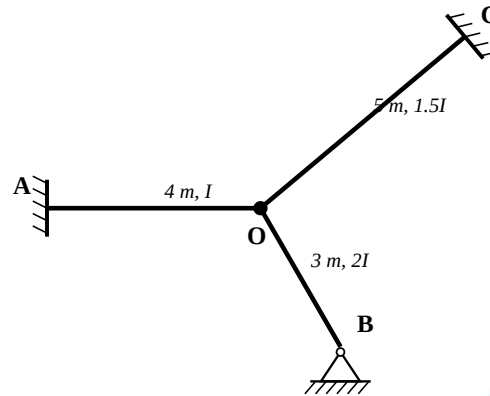


Fig. No. 1

- d) State any four assumptions made in the analysis of simple trusses.

Q.4 Attempt any THREE of the following:

12

- a) Draw neat sketches of any four types of trusses.
- b) Using Macaulay's method, find the deflection under the point load and at mid-span of the simply supported beam shown in Fig. No. 2. EI is constant.

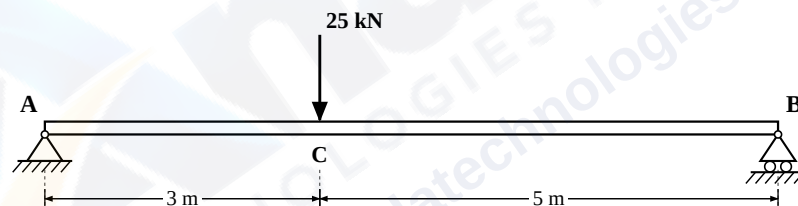


Fig. No. 2

- c) Explain radius of curvature and stiffness of a beam. Sketch the elastic curve of a simply supported beam carrying a central point load.
- d) Explain the procedure of analysis of a continuous beam by the moment distribution method.
- e) Draw neat sketches of symmetrical and unsymmetrical portal frames and state the differences between them.

Q.5 Attempt any TWO of the following:

12

- a) A continuous beam ABC is fixed at A and C and continuous over support B as shown in Fig. No. 3. Using the theorem of three moments, find the support moments and draw the SFD and BMD.

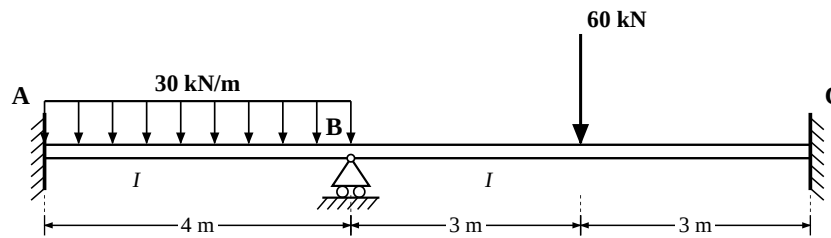


Fig. No. 3

- b) A cantilever AB, 3 m long, fixed at A, carries point loads of 12 kN at the free end B and 8 kN at 1 m from B, and a UDL of 4 kN/m over the whole length. Using Macaulay's method, find the slope and deflection at the free end and under the 8 kN load. Take $E = 2 \times 10^5 \text{ N/mm}^2$, $I = 5 \times 10^7 \text{ mm}^4$.

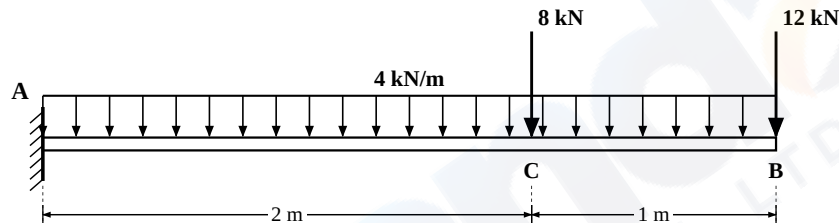


Fig. No. 4

- c) Using the moment distribution method, analyse the continuous beam ABC shown in Fig. No. 5 (A and C fixed). Draw the SFD and BMD.

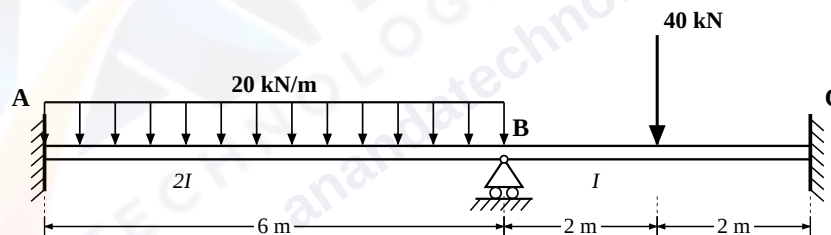


Fig. No. 5

Q.6 Attempt any TWO of the following:

12

- a) A continuous beam ABCD is fixed at A and simply supported at B, C and D, loaded as shown in Fig. No. 6. EI is constant. Using the moment distribution method, find the support moments and draw the BMD.

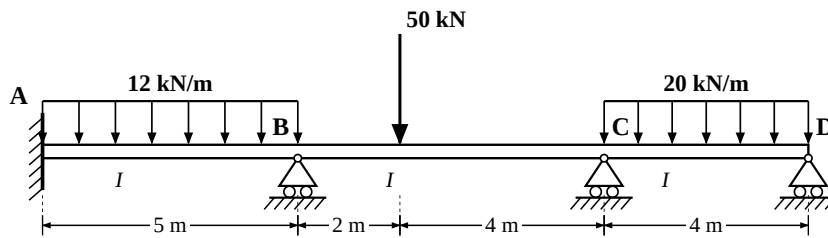


Fig. No. 6

- b) The cantilever truss shown in Fig. No. 7 is pinned to a wall at A and E. Using the method of joints, find the forces in all members and the reactions at A and E.

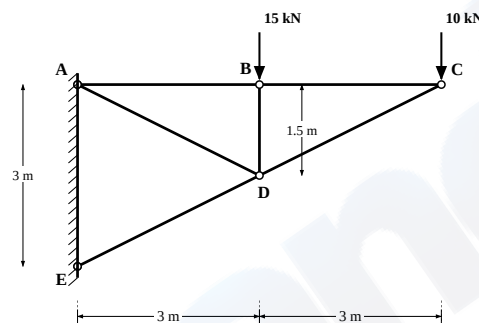


Fig. No. 7

- c) Using the method of sections, determine the forces in members BD, CD and CE of the truss shown in Fig. No. 8 (all inclined members are equally inclined).

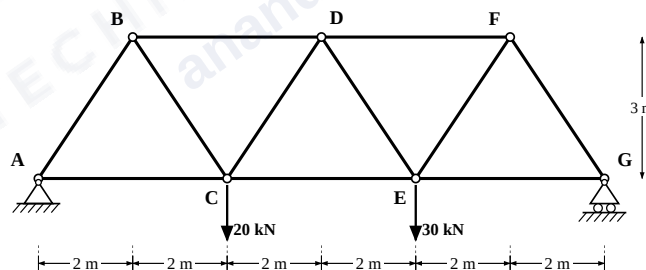


Fig. No. 8

Note: This is a **model question paper prepared by Ananda Technologies** only for practice and exam preparation, based on the pattern of previous MSBTE question papers and the K-scheme syllabus. It is **not an official MSBTE paper**, and it does **not** mean that these questions will come in the exam. Answers follow standard textbook points; marks shown are indicative. Free for students — anandatechnologies.in